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# When Alcohol is Only Part of the Problem: An Event-Level Analysis of Negative Consequences Related to Alcohol and Other Substance Use

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## Abstract

While alcohol remains the drug of choice for most college students, national data show that 40% of college students also use other substances (e.g., marijuana, cocaine, etc.). Longitudinal studies indicate that students who report use of both alcohol and other substances experience more consequences (e.g., blackout, arrests). The current study expands upon this research by using a multi-level approach to examine average and event-level alcohol combined with other substance use (ALC+) and its role on consequences experienced. In addition, the research examined which substance combined with alcohol posed the most risk. A total of 461 students reported on alcohol use, substance use, and consequences experienced (e.g., YAACQ) on 12 weekend nights (Thursday, Friday, Saturday) across 4 weekends in an academic year. Multilevel model analyses revealed a positive association between both average and event-level ALC+ use and the number of consequences experienced. A significant cross-level interaction was also revealed indicating students who typically combine alcohol and other substances experienced more consequences on occasions when they use more substances relative to students who typically use alcohol only. Finally, alcohol plus nicotine, or marijuana, or ADHD medications, or cocaine were all significantly positively related to increased consequences. These findings provide consistent evidence that ALC+ use is a highly prevalent behavior among college students that increases risk of problematic consequences.

### Keywords

college students; alcohol use; substance use; consequences

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Studies have shown that alcohol is the drug of choice among college students; however, the use of other substances is prevalent in this population. National data reveal that 40% of college students report using other substances. Over one third of students endorse using marijuana and tobacco annually (Johnston, O'Malley, Bachman, & Schulenberg, 2013). Prescription amphetamines (e.g., Adderall) are also popular among college students due to their ability to increase energy and stamina and lessen fatigue (Julien, Advokat, & Comaty, 2011). Students also misuse other drugs such as ecstasy, cocaine, and opiates, but to a lesser extent (Johnston et al., 2013).

Studies have examined increased risk and prevalence of negative consequences for students who report using alcohol and other substances. Findings indicate students who report both alcohol and other substance use experience more consequences (e.g., blackouts) compared to alcohol-only users (Haas & Smith, 2012). For example, those reporting both alcohol and marijuana use experienced a variety of physical consequences (e.g., hangovers, vomiting), legal consequences (e.g., driving intoxicated), and poor academic performance compared to alcohol-only users even after controlling for heavy drinking episodes (Shillington & Clapp, 2001; 2006). Similar associations have been observed for students reporting use of alcohol and non-medical use of prescription ADHD medications or opioids (Egan, Reboussin, Blocker, Wolfson, & Sutfin, 2013; McCabe, Cranford, Morales, & Young, 2006). Finally, there is a high prevalence rate for nicotine use in the age group encompassing college students (Johnston, O'Malley, Bachman, & Schulenberg, 2012). Studies show nicotine is associated with behavioral and biobehaviorial consequences such as anxiety, nausea, headache, vomiting, diarrhea, stomach cramping, and heart palpitations (Kassel, Stroud, & Paronis, 2003; US Department of Health and Human Services, 1988). The combined use of alcohol and nicotine is associated with increased drinking (Reed, Wang, Shillington, Clapp, & Lange, 2007; Weitzman & Chen, 2005), and the use of marijuana and other illicit drugs (Kuntsche, Rehm, & Gmel, 2004; O'Grady, Arria, Fitzelle, & Wish, 2008; Schorling, Gutgesell, Klas, Smith, & Keller, 1994). While the findings of these studies are suggestive of increased risk associated with combining alcohol with other substances, their methods make it difficult to pinpoint if alcohol and substances were used during the same occasions. Further, studies have not examined the relative risk of the number (alcohol + 1 or more substances) or type of substances combined with alcohol (e.g., marijuana + alcohol versus stimulants + alcohol) and their association with consequences. As a result, they do not provide clear guidance about the risk of combining alcohol with other substances (ALC+) in relation to increased harm. A more nuanced examination of ALC+ occasions is warranted to fill this important gap in the literature and inform prevention efforts.

## Current study

The current study used a longitudinal event-level design to gather insights into variations in ALC+ use and consequences during specific occasions. The research examined the substance use behaviors of student drinkers who endorsed using one or more substances in the past year and assessed their combined use of alcohol with other substances and consequences across 12 high-risk days (i.e., Thursday, Friday, Saturday) over 4 weekends. These included different weekend evenings across an academic year where students tend to drink heavily (home football games, holidays [e.g., Halloween]). Although alcohol-based

studies have been conducted using diary or ecological momentary assessment with college samples, they have examined isolated alcohol use, did not examine other substances (Collins, Kashdan, & Gollnisch, 2003; Collins et al., 1998; Muraven, Collins, Shiffman, & Paty, 2005), or have had a restricted focus on consequences (e.g., distress about drinking). Additionally, studies using diary approaches tended to focus on a limited amount of substances (e.g., marijuana only; Bravo, Pearson, Conner, & Parnes, 2017). To date, no study has examined the event-level use of alcohol combined with other substances and its association with experiencing a wide variety of consequences in college students.

The current study had multiple research goals. First, descriptive analyses were conducted to identify prevalence rates of alcohol and substance use calculated from the event-level reports. Next, multilevel modeling was conducted to address four specific questions: 1) Do students who typically engage in alcohol only use (ALC Only) experience fewer consequences compared to students who typically engage in ALC+ use? It was hypothesized that typical ALC+ users experience significantly more consequences relative to typical ALC Only users; 2) What is the relationship between the number of substances used with alcohol on an occasion and the number of consequences experienced? It was hypothesized that the number of substances used on an occasion will have a significant positive relationship with the number of consequences experienced; 3) Is the relationship between the number of substances used with alcohol on an occasion and the number of consequences experienced moderated by the typical substance use pattern across the events (e.g., ALC only vs. ALC+ use)? On alcohol only occasions, it was hypothesized that there would be no significant differences in the number of consequences reported by ALC only and ALC+ users. In contrast, there were two competing outcomes hypothesized on ALC+ occasions: 1) lower ALC+ users (e.g., ALC+1) would report significantly fewer consequences than higher ALC + users (ALC+ 2 or more), or 2) lower ALC+ users will report significantly more consequences than higher ALC+ users. The rationale for the former was that similar to risky drinkers, ALC+ users with a history of experiencing more consequences continue to engage in high-risk behaviors resulting in continued problematic outcomes (e.g., Mallett, Lee, Neighbors, Larimer, & Turrisi, 2006). Regarding the latter, it is plausible that individuals with less experience using ALC+ would have more problematic outcomes when they deviate from their typical pattern and engage in high-risk ALC+ behavior; 4) What is the association between the specific types of ALC+ use (e.g., ALC Only, ALC+ Marijuana, ALC+ Nicotine, ALC+ ADHD medications, ALC+ Cocaine) and the number of consequences reported? The literature on combining alcohol with other substances is fragmented, typically only examining alcohol with one other substance or examining ALC+ combinations for a specific consequence (e.g., sexual risk). Thus, this segment of the research was exploratory.

## Methods

### Procedures

A total of 719 students in their 3rd year at a large, public northeastern university were invited from a parent study on college student drinking and related consequences (see Mallett et al., 2015 for full procedure) to participate in a separate event-level study examining ALC+ use and consequences. To be eligible for the current study, students had to report both alcohol

use and use of another substance in the past year. Students were sent an invitation e-mail that included a description of the study, a URL to access the consent form, and a unique Personal Identification Number (PIN) to log in. Consented students were asked to complete an event-level survey for two consecutive weekends each semester for two semesters, for a total of 4 weekends in one school year. Three days prior to each event-level survey, students were sent an e-mail and text message alerting them that the survey link would be sent on Sunday. An e-mail and text message with the survey link were sent to students on Sunday so that they could report their behaviors that occurred on Thursday, Friday, and Saturday respectively. Participants were asked about their alcohol and substance use and related consequences *separately* for each day. Participants who did not respond within a few hours of receiving the survey link received three text messages and one additional e-mail reminding them to complete the survey. Participants had up to 48 hours to complete the survey, after which access was disabled to prevent retrospective reports of multiple days. Students received $20 for each of the four weekend assessments they completed (up to $80). All procedures were reviewed and approved by the university's Institutional Review Board.

Of the invited students, 461 consented and completed at least one event-level survey (64.1 % response rate). This response rate is similar to other studies using web-based recruitment methods (e.g., Turrisi et al., 2013) and event-level studies (e.g., Patrick & Maggs, 2009). At baseline, students were an average of 20.12 ($SD$ = 0.34) years old, and 88.5% Caucasian, 4.8% Asian, 3.0% Multiracial, and 2.6% Black or African American. A total of 3.7% of the students identified as Hispanic and 51.6% were female. Response rates ranged from 79.6% to 97.4% for each weekend. The average number of days completed across the study was 10.55, $SD$ = 2.38 (range was 1 to 12).

## Measures

All measures were assessed separately for Thursday, Friday, and Saturday of each of the four weekends totaling 12 days (W1, W2, W3, and W4). To address outliers, we used procedures recommended by Tabachnick and Fidell (1996) to recode scores outside the range to 3.29 times the standard deviation beyond the mean

**Substance use—**Students were asked to indicate which of the following drug categories they used on each occasion: alcohol, nicotine, marijuana, cocaine, amphetamines, ecstasy, inhalants, sedatives, hallucinogens, opioids, ADHD medications, and other drugs that were not listed. Each drug category was provided with a list of examples and street names (e.g., ecstasy [Molly, MDMA, etc.]). For the opioid and ADHD medication categories, students were instructed to only report use if the medications were not prescribed to them or were taken in quantities greater than prescribed to them. Students were asked to select all that applied. A separate option was provided to indicate if one did not use any substances on a particular day.

**Consequences—**Students were asked to report which of 45 possible consequences they encountered on each occasion. These items were taken directly from the Young Adult Alcohol Consequences Questionnaire (YAACQ; Read, Kahler, Strong, & Colder, 2006) and the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989), or were adapted from

these scales to assess additional physiological consequences that could occur from using substances other than alcohol (White, Labouvie, & Papadaratsakis, 2005). Example items include "I had heart palpitations," and "I felt dizzy." Consequences were summed for each day to compute an index score of total consequences (α's range .82 to .89).

## Data Analysis Plan

**Descriptives—**Overall and average endorsement rates across days (Thursdays, Fridays, Saturdays) for each substance use category were calculated. Similar endorsement rates were calculated for ALC+ use for substances endorsed by 5% of the sample.

**Multilevel analyses—**All multilevel model analyses were performed using SAS PROC MIXED. The intraclass correlation coefficient (ICC) was calculated from unconditional means models (i.e., model with no predictors) to estimate the percentage of variation accounted for by the between-person (level 2) and within-person (level 1) levels of analysis. Only occasions where alcohol was used were utilized for the analyses. Additionally, both Average ALC+ use (level 2 predictor) and event-level ALC+ use (level 1 predictor) were centered so the value of "0" reflected alcohol only use, "1" indicated alcohol plus one substance, "2" indicated alcohol plus two substances, and so on. Drinks consumed on an occasion and day of diary report (e.g., Thursday, Friday, Saturday) were added to all models as a Level 1 covariate and gender was added to all models as a Level 2 covariate. All covariates were mean centered and random effects and interactions between covariates and predictors were assessed. For parsimony, all interactions that were not significant were removed from the final models.

First, to address the question, "*Do students who typically engage in alcohol only use (ALC Only) experience fewer consequences compared to students who typically engage in ALC+ use?*", we examined the between-person Average ALC+ use as a level 2 predictor of consequences. Second, to address the question, "*What is the relationship between the number of substances used with alcohol on an occasion and the number of consequences experienced?*", the within-person effect of the number of substances used with alcohol on an occasion was examined as a level 1 predictor of consequences after controlling for level 2 Average ALC+ use. Finally, to address the question "*Is the relationship between the number of substances used with alcohol on an occasion and the number of consequences experienced moderated by the typical substance use pattern across the events (e.g., ALC only vs. ALC+ use)?*", we examined the effect of the interaction between level 1 predictors and level 2 predictors. In sum, three separate multilevel model equations were estimated. Model 1 included only the main effects represented in research question 1. Model 2 examined the main effects of the level 1 predictor controlling for the level 2 predictor. Model 3 added the interaction term for research question 3.

The final question examined "*What is the association between the specific types of ALC+ use (e.g., ALC Only, ALC+ Marijuana, ALC+ Nicotine, ALC+ ADHD medications, ALC+ Cocaine) and the number of consequences reported?"* Due to the large number of potential combinations, only the combinations that were endorsed in 5% or more of the sample were examined. A substance use combination variable was constructed by coding the substances

used for each occasion (e.g., alcohol only = 0, ALC+ nicotine =1; ALC+ marijuana =2, etc.). A multilevel analysis was conducted using substance use combination as a level 1 predictor and all the same covariates as in aim 1 were included in the model.

## Results

### Descriptive Information

Table 1 shows overall and average endorsement rates across days (Thursdays, Fridays, Saturdays) for each substance use category. Alcohol, marijuana, and nicotine had the highest rates of endorsement, with over a third of the sample endorsing their use. ADHD medications and cocaine also had overall rates of endorsement that exceeded 5%. All remaining substance use categories were endorsed by fewer than 3% of students. The average number of consequences experienced on each occasion was 2.82 ($SD$ = 3.52) with amounts ranging from 0 to18.

A total of 916 ALC+ events were reported across the sample over the 12 days with 57.4% of the sample endorsing at least one ALC+ event. As shown in Table 2, one or more additional substances were used on over 25% of the occasions when alcohol was used. For the majority of these occasions, alcohol was used with only one additional substance. However, over 5% of all alcohol occasions included use of 2 additional substances, and over 1% included use of 3 or more additional substances.

### Multilevel Analyses of the Effects of ALC+ Use on Consequences

**Do students who typically engage in alcohol only use (ALC Only) experience fewer consequences compared to students who typically engage in ALC+ use? (Level 2)—**Controlling for number of drinks consumed on an occasion, day of diary report, and gender, there was a significant and positive association between Average ALC+ use and the number of consequences experienced ($b$= 0.81, $SE$ = 0.19, $p$ < 0.001). When student level of Average ALC+ use was low (e.g., ALC only use) fewer consequences were experienced relative to when Average ALC+ was high (e.g., ALC+ use).

**What is the relationship between the number of substances used with alcohol on an occasion and the number of consequences experienced? (Level 1)—**After controlling for number of drinks consumed on an occasion, day of diary report, gender, and Average ALC+ use (Level 2), results indicated a positive relationship between the number of substances used when also consuming alcohol on an occasion and number of consequences experienced ($b$ = 0.50, $SE$ = 0.11, $p$ < .001).

**Is the relationship between the number of substances used with alcohol on an occasion and the number of consequences experienced moderated by the typical substance use pattern across the events? (Level 1 and Level 2 interaction)—**A significant interaction (moderator effect) was observed between Level 1 and Level 2 predictors (see Table 3 for fixed and random effects). The nature of the moderator effect can be seen in Figure 1 for three striations of Average ALC+ use: ALC Only users (i.e., students who, on average, do not use any other substances when consuming

alcohol); ALC+1 users (i.e., students who typically use 1 other substance when also consuming alcohol), and Higher ALC+ users (i.e., students who typically use 2 additional substances when also consuming alcohol). Post hoc examination of the simple slopes indicated that both the Lower ALC+ and Higher ALC+ groups had slopes that were significantly greater than zero ($b = 0.60$, $t(2805) = 5.20$, $p < .001$; $b = 1.05$, $t(2805) = 4.26$ $p < .001$, respectively), whereas the ALC Only group did not have a significant slope ($r = 0.153$, $p = 0.39$). This indicates that, for individuals who typically use other substances when also consuming alcohol, as their number of substances increased per occasion, they experienced significantly more consequences. This latter effect was exacerbated for Higher ALC+ users.

**What is the association between the specific types of ALC+ use (e.g., ALC Only, ALC+ Marijuana, ALC+ Nicotine, ALC+ ADHD medications, ALC+ Cocaine) and the number of consequences reported?—**The final question examined which substance combined with alcohol posed the most risk among those most commonly used (e.g., marijuana, etc.). After controlling for number of drinks consumed on an occasion, day of diary report, and gender, there were significant differences observed when comparing alcohol only occasions to ALC+ nicotine ($b = 0.39$, $SE = 0.19$, $p < 0.05$), ALC+ marijuana ($b = 0.34$, $SE = 0.16$, $p < 0.05$), ALC+ ADHD medications ($b = 1.07$, $SE = 0.52$, $p < 0.05$), and ALC+ cocaine ($b = 1.86$, $SE = 0.82$, $p < 0.05$) occasions (See Table 4).

Last, we examined differences in endorsement rates among the most prevalent specific consequences associated with each of the ALC+ combinations and ALC Only use (see Table 5). The consequences examined in these analyses were selected if they were endorsed by 20% or more of respondents for any ALC+ combination. Due to the smaller samples sizes, alcohol and cocaine and alcohol and ADHD were combined to form an “alcohol and stimulants” category. These analyses revealed no significant differences across the combinations for the frequency of endorsing having experienced headaches, saying or doing embarrassing things, and not eating properly. The analyses revealed significant differences across the ALC+ combinations for drinking more than originally planned, being more intoxicated than originally planned, saying harsh or cruel things, and blacking out. Combining alcohol with stimulants resulted in significantly more of these specific consequences compared to other ALC+ combinations or ALC Only use.

## Discussion

The current study used a longitudinal event-level design to gather insights into variations in ALC+ use and consequences during specific occasions. The research examined the substance use behaviors of student drinkers who endorsed using one or more substances in the past year and assessed their combined use of alcohol with other substances and consequences across 12 different high-risk weekend days. Several findings warranted discussion. On a descriptive level, nearly 60% of our sample students reported ALC+ use and over 1 in 4 drinking occasions involved the use of one or more substances. This demonstrates that a significant portion of college students reports engaging in ALC+ behavior.

Results of our multilevel analyses were consistent with our hypotheses, such that on occasions when students engaged in ALC+ use, they reported more consequences compared to ALC Only occasions. This was observed to be the case independent of the amount of alcohol consumed on these occasions. Further, occasions where an increased number of substances were used resulted in experiencing more consequences. When typical use patterns were examined as a moderator, our findings revealed an elevated risk for students who typically engage in higher ALC+ use. Specifically, individuals who typically engaged in higher ALC+ use experienced more consequences as they increased the number of substances used on an occasion compared to individuals who typically engaged in ALC Only use. On occasions involving ALC+ use, individuals who typically only use alcohol seem to experience fewer consequences than individuals who typically engage in ALC+ use. This finding is consistent with our first proposed hypothesis and the literature showing drinkers with a history of experiencing more consequences continue to engage in high-risk behaviors resulting in continued problematic outcomes (e.g., Mallett et al., 2006). Thus, students who typically engage in higher ALC+ use are not altering behavior and are at a continued elevated risk. An additional consideration is that higher ALC+ users may be using higher doses of the additional substances relative to the lower ALC+ user groups, resulting in greater consequences. One of the challenges in evaluating substance use (i.e., cocaine, marijuana, etc.) is the absence of standardized doses which are used to measure alcohol consumption (i.e., standard drink size). Therefore, it is unclear exactly how much of a substance is ingested during an occasion and how this relates to consequences.

The current study also examined specific ALC+ combinations and their association with consequences. The findings demonstrated all of the specific combinations examined (ALC+ nicotine, ALC+ marijuana, ALC+ cocaine, ALC+ ADHD medications) resulted in significantly more consequences than ALC Only use. While ALC+ cocaine resulted in the most problems, all of the combinations had significantly elevated risk. Additionally, the examination of specific consequences resulting from the ALC+ combinations highlighted the harm associated with alcohol combined with stimulants. Drugs that have an antagonistic relationship with alcohol may offset its depressant effects resulting in individuals feeling more alert and continuing to drink/party. Alternatively, drugs that have an agonistic effect and exacerbate certain effects of alcohol (e.g., relaxation) may result in different consequences (e.g., feeling more intoxicated). Additional research is needed to examine biological mechanisms of ALC+ combinations and how they impact a variety of problematic outcomes.

In addition to the actual ALC+ use, other factors may play a role in students experiencing consequences. For instance, students may have different motives to engage in ALC+ use such as synergistic, experimentation, or antagonistic effects that may result in differential levels of use of protective behaviors, risky behaviors, and impairment. Further, these motives may drive the use of specific ALC+ combinations (e.g., ALC+ marijuana, ALC+ ADHD meds, etc.). Additionally, students who engage in higher ALC+ use may be more willing to experience consequences and take fewer precautions to avoid them. Research has shown that among drinkers, willingness to experience problems was significantly associated with experiencing problems when controlling for alcohol consumption (Mallett, Varvil-Weld,

Turrisi, & Read, 2011). Understanding such influences and how these are related to experiencing specific consequences seem warranted in future research.

Although our study provides insights into how combining alcohol with other substances is far riskier than alcohol use alone, it is not without some limitations. First, the event level study surveyed students' behaviors about substance use that occurred during Thursday, Friday, or Saturday. This approach is limited to capturing the overall "day" use rather than the specific ordering of when substances were consumed, in what doses, and when specific consequences occurred. Examining these behaviors and outcomes with such specificity might seem premature without the observations and findings from the present study. It is plausible that future research can attempt to address these limitations by the use of innovative ecological momentary assessment methods that include biological and behavioral assessments. Additionally, data were collected using self-report methods. While the vast majority of studies use this approach, individuals may have some inaccuracies in reporting their substance use behaviors. Finally, it should be noted that the findings are reflective of high-risk college students who engage in ALC+ behaviors and do not generalize to all college students. Considering approximately 40% of students report using substances other than alcohol, more research is needed to examine individual differences such as impulsivity and how it contributes to both ALC+ use and experiencing consequences. Further, environmental factors such as location of ALC+ and ALC Only use should be explored to identify settings that increase the likelihood of engaging in high-risk behaviors and experiencing related problems.

In conclusion, findings from the current study demonstrate the increased risk associated with ALC+ use. Combining alcohol with other substances is a prevalent behavior among college students that increases risk of problematic consequences. Additional research is needed to better understand this phenomenon and inform intervention efforts targeting this population.

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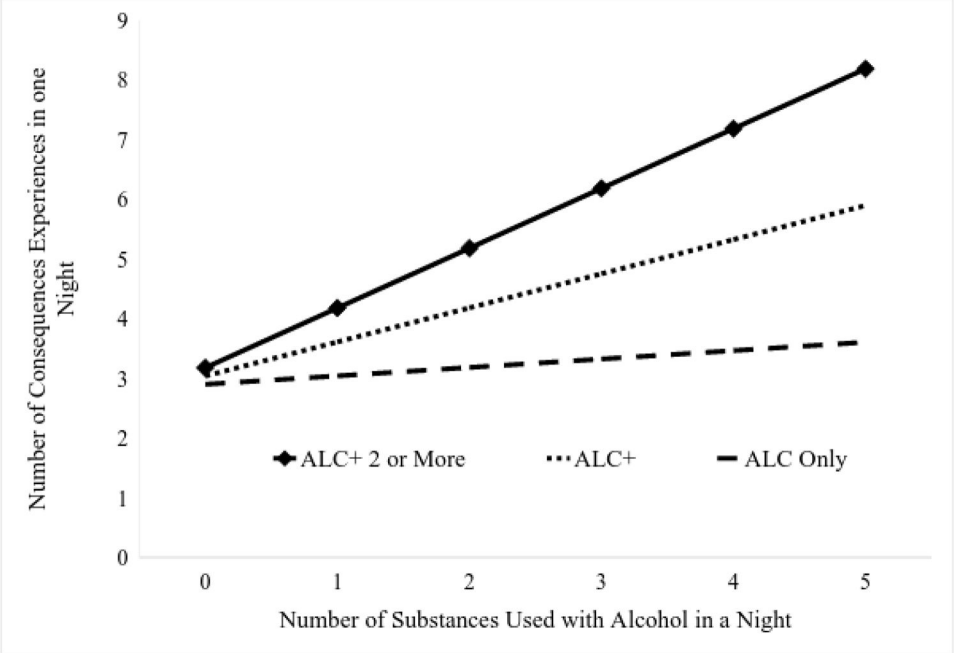


**Figure 1. Consequences as a Function Within- and Between Person Substance Use**

*Note:* Value of 0 on *X*-axis indicates occasions with use of alcohol only.

*Note:* ALC+ users typically use alcohol with 1 other substance; Higher ALC+ users typically used alcohol with 2 additional substances.

**Table 1**

Average Endorsement Rates of Alcohol and Substance Use

| | Percentage of Endorsement | | | |
|---|---|---|---|---|
| **Drug** | **Any Use** | **Thursdays** | **Fridays** | **Saturdays** |
| Alcohol | 99.3% | 50.6% | 75.0% | 74.9% |
| Marijuana | 41.6% | 13.4% | 13.5% | 10.4% |
| Nicotine | 36.2% | 11.4% | 11.2% | 11.5% |
| ADHD medications | 11.3% | 1.9% | 1.2% | 2.7% |
| Cocaine | 8.0% | 0.8% | 1.5% | 1.2% |
| Sedatives | 2.2% | 0.4% | 0.6% | 0.4% |
| Ecstasy | 1.3% | 0.0% | 0.2% | 0.2% |
| Opioids | 0.9% | 0.1% | 0.1% | 0.2% |
| Other drugs | 0.4% | 0.0% | 0.1% | 0.0% |
| Amphetamines | 0.2% | 0.1% | 0.0% | 0.0% |
| Inhalants | 0.0% | 0.0% | 0.0% | 0.0% |
| Hallucinogens | 0.0% | 0.0% | 0.0% | 0.0% |
| ALC+ | | | | |
| Alcohol + Marijuana | 39.4% | 9.0% | 11.4% | 12.3% |
| Alcohol + Nicotine | 35.3% | 8.4% | 10.4% | 10.7% |
| Alcohol + ADHD | 10.2% | 1.4% | 1.0% | 2.6% |
| Alcohol + Cocaine | 7.8% | 0.8% | 1.4% | 1.2% |

**Table 2**

Number and Percentage of Occasions Additional Substances were Used with Alcohol

| | Alcohol Only | Alcohol + 1 Substance | | Alcohol + 2 Substances | | Alcohol + 3 or more | |
|---|---|---|---|---|---|---|---|
| **Number of Occasions** | **2366 (72.1%)** | **701 (21.4%)** | | **175 (5.3%)** | | **40 (1.2%)** | |
| Breakdown by Substance(s) | | | | | | | |
| | | +N | 294 (41.9%) | +N+MJ | 116 (66.3%) | +N+MJ+ADHD | 14 (35%) |
| | | +MJ | 360 (51.4%) | +N+ADHD | 16 (9.1%) | +N+MJ+C | 6 (15%) |
| | | +ADHD | 28 (4.0%) | +N+C | 11 (6.3%) | +N+MJ+S | 3 (7.5%) |
| | | +C | 11 (1.6%) | +MJ+ADHD | 10 (5.7%) | +N+MJ+C+ADHD | 3 (7.5%) |
| | | | | +MJ+C | 10 (5.7%) | | |

*Note*. N= Nicotine. MJ = Marijuana. C = Cocaine. S = Sedatives. ADHD = ADHD Prescription medication (e.g. Adderall)

## Table 3

Fixed and Random Effects of Multilevel Model Examining the Cross-Level Interaction of ALC+ Use on Consequences Experienced

| **Fixed Effects** | **Estimate (S.E.)** |
|---|---|
| Intercept | 2.90 (0.13)** |
| Level 1 | |
| Event-Level ALC+ Use (*Predictor*) | 0.14 (0.23) |
| Drinks Consumed (*Covariate*) | 0.38 (0.02)** |
| Day of Diary Report (*Covariate*) | −0.57 (0.06)** |
| Drinks Consumed * Day of Diary Report (*Covariate*) | −0.09 (0.01)** |
| Level 2 | |
| Average ALC+ Use (*Predictor)* | 0.14 (0.18) |
| Gender (*Covariate*) | 1.60 (0.22)** |
| Cross-Level Interactions | |
| Average ALC+ Use * Event-Level ALC+ Use (*Predictor*) | 0.43 (0.18)* |
| Gender * Drinks Consumed (*Covariate*) | 0.21 (0.03)** |
| Gender * Day of Diary Report (*Covariate*) | −0.35 (0.13)** |
| **Random Effects** | |
| Event-Level ALC+ Use | |
| Variance of Intercepts | 3.60 (0.35)** |
| Variance of Slopes | 0.43 (0.21)* |
| Covariance (Intercept, Slope) | 0.30 (0.21) |
| Drinks Consumed | |
| Variance of Intercepts | 0.32 (0.04)** |
| Variance of Slopes | 0.03 (0.01)** |
| Covariance (Intercept, Slope) | −0.01 (0.03) |
| Residual | 5.66(0.17)** |

Note: Log-likelihood difference tests were used to build the final model. All possible within- and cross-level interactions were tested and all non-significant interactions were removed from the final model.

Note:

* $p < .05$,

** $p < .001$

## Table 4

Fixed and Random Effects of Multilevel Model Comparing Different Substance Use Combinations to Alcohol Only Use on Consequences Experienced

| **Fixed Effects** | **Estimate (S.E.)** |
|---|---|
| Intercept | 2.96 (0.11)** |
| Level 1 | |
| Substance use Combination (*Predictor)* | |
| Alcohol Only | Ref |
| Alcohol + Nicotine | 0.39 (0.19)* |
| Alcohol +Marijuana | 0.34 (0.17)* |
| Alcohol +ADHD Medication | 1.07 (0.53)* |
| Alcohol +Cocaine | 1.86 (0.82)* |
| Drinks Consumed (*Covariate*) | 0.38 (0.02)** |
| Day of Diary Report (*Covariate*) | −0.61 (0.07) |
| Substance Use Combination * Day of Diary Report (*Covariate)* | |
| Alcohol Only * Day of Diary Report | Ref |
| Alcohol + Nicotine * Day of Diary Report | 0.10 (0.20) |
| Alcohol +Marijuana * Day of Diary Report | −0.08 (0.18) |
| Alcohol +ADHD Medication * Day of Diary Report | 1.66 (0.55)* |
| Alcohol +Cocaine * Day of Diary Report | 3.04 (1.14)* |
| Level 2 | |
| Gender (*Covariate*) | 1.52 (0.22)** |
| Cross-Level Interactions | |
| Gender * Drinks Consumed (*Covariate*) | 0.19 (0.03)** |
| Gender * Day of Diary Report (*Covariate*) | −0.28 (0.13)* |
| Drinks Consumed * Day of Diary Report (*Covariate*) | −0.10 (0.01)** |
| **Random Effects** | |
| Drinks Consumed | |
| Variance of Intercepts | 3.89 (0.35)** |
| Variance of Slopes | 0.03 (0.01)** |
| Covariance (Intercept, Slope) | −0.34 (0.04)** |
| Residual | 5.52 (0.16)** |

Note:

* $p < .05$,

** $p < .001$

**Table 5**

Percentages of modal consequences associated with specific ALC+ combinations

| Consequence | Alcohol Only (N=2270) | Alcohol +Nicotine (N=279) | Alcohol + MJ (N=328) | Alcohol + Stimulant (N=35) | $X^2$ (df=3, N=2912) |
|---|---|---|---|---|---|
| Said or did embarrassing things | 17.1% | 19.4% | 18.0% | 22.9% | 1.68 |
| Drank more than originally planned | 21.4% | 28.3% | 22.9% | 34.3% | 9.91 * |
| Became more high/intoxicated than originally planned | 15.7% | 24.0% | 23.2% | 34.3% | 27.17 ** |
| Did not eat properly | 20.4% | 26.5% | 24.7% | 20.0% | 7.85 |
| Said harsh or cruel things | 3.3% | 6.5% | 4.0% | 20.0% | 31.94 ** |
| Blackout | 9.8% | 14.0% | 16.8% | 25.7% | 24.14 ** |
| Dry mouth | 15.6% | 16.8% | 35.4% | 20.0% | 75.84 ** |
| Headache | 21.4% | 23.3% | 15.9% | 14.3% | 7.31 |

Note:

* $p < .05$,

** $p < .001$